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ABSTRACT

The study examined the effects of a pre-training general imitation experience on the learning of manual signs by 12 severely mentally retarded children (8-14 years old) and compared the effectiveness of three training methods--imitation, molding, or both. Ss were exposed to a pre-training experience consisting of either free play or general imitation training. Ss were then taught to produce nine manual signs, three by each of the training techniques. Post-test data revealed that Ss receiving the pre-training imitation experience produced a greater number of signs to criteria and a greater number of correct responses to the sign stimuli. Ss responded more frequently to sign stimuli presented in the imitation alone or imitation/molding training modes than in the molding alone mode. (DB)

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Effects of General Imitation Pre-Training on the Acquisition of Manual Signs by Severely Retarded Children

[Final Report]

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EFFECTS OF A PRE-TRAINING GENERAL IMITATION EXPERIENCE ON THE ACQUISITION OF MANUAL SIGNS BY SEVERELY RETARDED CHILDREN: A PRELIMINARY REPORT*

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Literature supports using non-speech communication, such as manual signing, as a communication training mode with severely retarded persons who lack functional speech and language abilities. However, little evidence exists to support the use of the techniques of either imitation, molding, or a combination of the two as the most effective sign training method with this population. Further, the literature fails to address the importance of the existence of a general imitation system within each child as a facilitator to any method of sign training. The goal of this research is to examine the effects of a pre-training, general imitation experience on the learning of manual signs by severely retarded children lacking functional speech and language, and to provide an evaluation of the effectiveness of the three major sign training methods. The outcome will facilitate more effective communication programming for these subjects.

The experimental method involved 12 subjects who were randomly assigned to a pre-training experience consisting of either free play or general imitation training. Each of these two groups were then taught to produce nine manual signs, three by each one of the training techniques determined in random order. Data were collected in an attempt to answer the following research questions for this population:

1. Does pre-training in general imitation facilitate the acquisition of manual signs when taught by any major training method? Which method is most greatly influenced?
2. Which major method of sign training appears more effective?
3. Is there incidental expressive or receptive sign acquisition as a result of the pre-training and/or any given training method?

The basic design for this research was a 2 (pre-training: free plan vs. general imitation) by 3 (training: imitation vs. molding vs. imitation/molding) factorial. Training methods were treated as a within-subjects variable, and pre-training was treated as a between-subjects variable.

It is essential that pre-linguistic questions of this type be answered to provide clinicians and educators with information enabling them to develop and apply the most effective teaching strategies possible to aid the severely handicapped child in the acquisition and functional use of an effective communication mode.

EC 170018

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Abstract

Literature supports using non-speech communication such as manual signing with non-verbal, severely retarded persons. However, little evidence exists to support imitation, molding, or a combination of the two sign training methods as most effective with this group. Further, the literature fails to address the importance of the existence of a general imitation system within each child as a facilitator to any method of sign training. The purpose of this study was to examine the effects of pretraining general imitation on the acquisition of manual signs by severely retarded, institutionalized children when each of the sign training methods are used.

Subjects were presented with a pre-training experience of either free play (control group) or general imitation training (experimental group). Following the pre-training period, each of the two groups were then taught to produce nine manual signs, three by each of the training methods: imitation alone, molding alone, or the two in combination. Results indicated that the experimental group produced a greater number of signs to criteria than the control group, and a significantly greater number of correct responses to the sign stimuli than control subjects. Examination of post-test data revealed that experimental children responded significantly more often than control children to the post-test stimuli. Subjects also responded more frequently to sign stimuli presented in the imitation or imitation/molding modes. It was concluded that a pre-training in general imitation appeared to have facilitated the ability of the severely mentally retarded subjects in this study to produce manual signs and to form a response set. Teaching and clinical implications of the research are discussed.

Effects of General Imitation Pre-Training on the Acquisition of Manual Signs by Severely Retarded Children

> One of the most pervasive problems among mentally retarded persons is disorders of communication. . . . Over 70% have some form of speech problem, with many of the more severely retarded having no functional speech (Fristoe & Lloyd, 1979, p. 401).

Attempts to train severely retarded individuals to use oral communication in a spontaneous, functional manner have met with limited success when a developmental model was employed (Graham, 1976; Schiefelbusch & Lloyd, 1974). Remedial approaches have been somewhat more successful with some clients (Guess, Sailor, & Baer, 1977), but despite varied attempts, there still exists a group of severely retarded clients for whom verbal language training has been unsuccessful (Fristoe & Lloyd, 1979). Much information has been gathered regarding the efficacy of using signing as a communication method for the severely retarded, non-verbal child (for reviews, see Fristoe & Lloyd, 1979; Kiernan, 1977; Lloyd, 1976). Three of the most common methods used in training sign are imitation, molding, and a combination of the two. One of the most critical questions to be considered in teaching a manual sign system is: Which teaching method will be most effective?

Imitation has been defined as a type of training which does not involve direct contact with the subject by the trainer, but does involve an active collaboration on the part of the subject (Fouts, 1972). The subject must simply watch the trainer, then imitate him. Imitation is dependent on social circumstances (Bandura & Walters, 1963), and is enhanced by an affective relationship between model and subject (Flanders, 1978). Striefel (1974)

defines imitative behavior as including two components: 1) the behavior of one person must be similar to that of another, and 2) the imitative response must closely follow the action of the first person. It should be like looking in a mirror and seeing a delayed reflection of your own behavior.

There are no reports of normal children older than five years of age being unable to imitate (Hekkema & Freedman, 1978). However, it has been reported that in four to seven year old severely retarded children (one institutionalized, eight noninstitutionalized), imitative behavior was not detected to any significant degree in any child (Guralnick, 1972). Further studies (Talkington & Altman, 1973; Altman, Talkington, & Cleland, 1972; Spradlin & Girardeau, 1966) also indicate that severely retarded subjects do not show spontaneous imitation. Despite these reports, several studies support the idea that severely retarded subjects can be trained to immediately imitate a modeled response (Hekkema & Freedman, 1978). Several language training programs for the severely retarded are based on imitative responses (e.g., Kent, 1974; Guess, Sailor, & Baer, 1976; Tawney & Hipsher, 1970). Molding, or gently forcing the subject to make a passive movement (Fouts, 1972), has been found to be an effective training procedure with both autistic children (Lovaas, Berberich, Perloff, & Schneffer, 1966; Bonvillian & Nelson, 1976; Donellan-Walsh, Gossage, LaVigna, & Schuler, 1976; Schaefer, Musil, & Kollinzas, 1980) and severely retarded children (Baer, Peterson, & Sherman, 1967). Molding is defined as physically molding or forming the hands and arms of the subject into the appropriate position for the sign (usually in the presence of an object or action that represents the sign) without modeling the sign for the child (Fouts, 1975). Bonvillian and Nelson (1976) successfully taught signing to a mute autistic boy through molding. Striefel (1974) presented an entire book based on the premise

that molding and shaping-fading must be used to teach imitation.

Although Bricker (1972) had success in using imitative sign training as a facilitator of word-object association with low functioning children, using a training sequence of imitative sign, sign-word and sign-object training, the use of imitation per se as a pure training method for teaching signs has not been advocated.

Mayberry (1976) believes that training methods for sign are as varied as the methods for teaching speech. She stated that molding is most useful for teaching signs which take the shape of the object they denote. She teaches molding through placing the object in the child's hand, then removing the object while keeping the child's handshape the same. Mayberry considered "shaping" similar to molding but without the use of the referent object in training. (This definition of "shaping" is unlike the more common behavioral definition of "shaping," which is defined as rewarding successive approximations to a correct response.) She feels that imitation should be combined with molding for training signs.

Most researchers agree that, depending on the child, the method of molding or a combination of molding, behavioral shaping, and fading are the preferred methods, and are usually paired with speech. No available studies support the sole use of imitation as a training method, although many agreed that imitation may be the ultimate goal and that imitation and molding may be paired in training where beneficial. Even though molding, imitation, and a combination of the two are the major techniques used in the teaching of sign, no one has systematically investigated the relative effectiveness of these three methods. Because of the difficulties a retarded child has in producing true imitative acts, a majority of the research training in signing for this population is done through molding. However, a search of

the literature revealed no objective studies conducted to determine whether or not molding would be the most effective training method for teaching signing if a child possessed the ability to immediately imitate a response. Further, no one has examined the effect of general imitation as a pre-training experience or imitation as a method of sign training, and its possible facilitative effect on the molding or combination molding/imitation methods of teaching sign.

It is essential that pre-linguistic questions of this type be answered to provide clinicians and educators with information enabling them to develop and apply the most effective teaching strategies possible to aid the severely handicapped child in the acquisition and functional use of an effective communication mode. Therefore, the purpose of this study was to determine the effects of a pre-training general imitation experience on the acquisition of manual signs by severely retarded children. More specifically, the effectiveness of the three primary sign training methods (imitation, molding, and imitation/molding combined) was systematically evaluated for use with severely retarded children, and attempts were made to determine if building in a general imitation response network would facilitate correct production and retention of the sign once production was mastered. Finally, the effects of general imitation as a pre-training method on incidental learning of comprehension and expression of signs that had not been trained was examined.

Method

Subjects

The subjects were 12 severely retarded (as defined by the AAMD classification system, see Grossman, 1977), non-verbal children (MA $\geq$ 18 mos., CA 8-14 years) selected from New Castle State Hospital and Training Center.

Additional constraints on subject selection were as follows: (1) The subjects had no previous training in signing. This determination was made through the use of educational reports, the parents, clinician/teachers, aides, and other knowledgeable contacts. (2) Subjects were classed as non-imitative by parents', teachers'/clinicians', and therapists' reports, and any formal or informal test measures available in the records of the child. (3) The subjects' hearing was within normal limits; defined as no loss greater than 25 db HTL in the better ear over the range of 500-2000 Hz as determined by pure-tone audiometry conducted by the hospital, using behavioral audiometry such as Tangible Reinforcement Operant Conditioning Audiometry (TROCA) (Cox & Lloyd, 1976). (4) No significant, uncorrected visual problems were reported for any subject in his/her hospital records.

Design

The basic design for this experiment was a 2 (pre-training: free play vs. general imitation) X 3 (training: imitation vs. molding vs. imitation/molding) factorial with training method treated as a within-subjects variable. The dependent variables of primary interest were:

1. Number of presentations of stimulus until correct production
2. Number of responses per session per sign
3. Number of sessions to correct sign production mastery
4. Number of sign productions retained one day after mastery
5. Number of receptive signs (nine from pre-test) correct in post-test
6. number of expressive signs (nine from pre-test) correct in post-test

Stimuli

All sign stimuli which were employed in the study met the following criteria: (1) Signs were low in transparency, as determined by Lloyd and Fristoe (1978). (2) No sign which represented a natural gesture of a child

(as "eat") was used. (3) Touch signs were used exclusively. (4) Signs did not represent any toy available to the subject in the playroom. (5) All signs were chosen from the Signed English Dictionary (Bornstein, Hamilton, Saulnier, & Roy, 1975). The nine signs ultimately selected for use were 1) APPLE, 2) DRESS, 3) SHOE, 4) TRAIN, 5) CANDY, 6) BREAD, 7) CHAIR, 8) WATER, and 9) FORK.

Procedures

Two experimenters participated in the preparation, training, and testing of each child. The experimenters were both female and of approximately equal age. They received equal training in procedural administration. Both experimenters trained subjects under all conditions, and subjects were randomly assigned to an experimenter before experimental procedures began. Each experimenter was responsible for one-half of the total sample.

In the procedures which were video taped (pre-testing, training, and post-testing) the camera was in a fixed position. The experimenter turned the camera on as her subject entered the room, and turned it off at the end of each session.

Pre-Tests

The subject pool received a general imitation pre-test to confirm that all subjects were non-imitative for the purpose of this study. This pre-test consisted of the nine manual signs listed above, and the first nine gross-motor movements identified by Bricker and Bricker (1970) as easy to imitate. The total of 18 stimuli were randomly ordered and presented to each subject in the following manner:

a) Verbal stimuli--"Look at me," followed by examiner turning the child's head toward her and tilting it up to gain eye contact if the subject did not exhibit this spontaneously.

b) Verbal stimuli--"Do this," followed by the first item from the random list of imitative responses. Each subject was allowed 10 seconds to respond after examiner's production of the stimulus. In judging a sign response as correct or incorrect, some latitude was given on articulation, but general hand configuration and/or movement, as well as initial and final placement of the sign in relation to the subject's body was correct. Gross-motor movements had to be produced correctly within the 10 second period. Verification of correct/incorrect responses was made by two external judges who were proficient in signing. They reported the percent of agreement on each response seen on the video tape. One-hundred percent agreement was required for the classification of any response as imitative. Subjects were classed as non-imitative if they were not able to imitate 15 of the 18 stimulus items.

Since all subjects had to be forced to attend more than three times during the pre-test period, they were all trained in attending behaviors prior to their pre-training experience. Attention training followed the first seven steps described by Tawney and Hipsher (1970, pp. 46-46) and was reinforced, in the manner they described, with touch and verbal praise. Criterion for each step was five minutes of correct performance with minimal reinforcement. All subjects were then required to demonstrate an understanding of "Show me _____," and demonstrate the ability to touch items on request. Any child unable to do this was trained according to the method described by Tawney and Hipsher (1970, pp. 69-72) substituting "Show me" for "Touch" as described in their trianing procedure.

The subjects also received a receptive sign pre-test (videotaped and viewed) to confirm that each subject lacked receptive signing skills. The

nine signs presented during the imitative pre-test were used. Each sign's picture referent was placed on a table in front of the child. Each child was commanded "Look at me," then "Show me _____" while the examiner formed one of the pre-test signs. The child was allowed 10 seconds from the time of the examiner's production to indicate (by pointing, touching, etc.) the correct response. This was repeated for all nine signs. Tests were administered five times over a two day period for each subject picture. Referents were positioned in random order for each presentation. If a child responded correctly two or more times out of five presentations for any one sign, he would have been classed as having previous knowledge of signs and been ineligible for the study. However, no subject was determined to have any receptive sign skills by this pre-test. At the conclusion of pre-testing and attention training, the 12 subjects were randomly assigned to one of two groups--Control or Experimental with six subjects in each group.

Pre-Training Experience

Control Group. Each subject was brought into the playroom of the hospital and allowed to participate in free play activities with available materials. The experimenter was with the child, and participated in the child's chosen activity, and interacted with him/her. If the child did not initiate play activity, or engaged in self-stimulation activities, the experimenter initiated activities and engaged the child in play. No training took place, and imitative activities (if they occurred) were not followed by presentation of food or verbal praise. The purpose of this experience was to increase rapport, and minimize the effects of experimenter contact vs. non-contact. This phase consisted of five consecutive days of contact: two 30-minute sessions per day per child. The assignment for specific time periods for any given subject or condition was determined randomly.

Experimental Group. For the same amount of time, and in the same location, these children were in one-to-one contact with the examiner to increase rapport plus receive training in imitative skills. The list of 20 gross-motor movements described by Bricker and Bricker (1970) were used in training (the first nine of which were included in pre-testing) in the order suggested. No manual signs were trained during this period. The training procedure described by Bricker and Bricker (1970) was followed, using "Look at me," and "Do this _____." The experimenter performed the stimulus, and 10 seconds was allowed for the response. Behavioral shaping of successive approximation and fading were used in training, but no molding was used. Reinforcers were in the form of food and verbal praise.

Training

Each subject in the control and experimental groups received training to produce the nine signs used in the receptive sign pre-test. Three signs were trained through each training method: imitation, molding, and imitation/molding combined. The three signs trained in each method were chosen in a randomized manner, with the constraint that no more than two of the signs would be produced at the same place relative to position on the body. This constraint was necessary to control for the possibility that some retarded subjects may possess an ideosyncratic aversion to a particular hand/body placement, and because literature on the acquisition of manual signs suggests that some signs produced in particular positions may be acquired earlier than others. The researcher wished to avoid any possible inequality of sign production difficulty across training methods.

There were six presentation conditions which consisted of all possible presentation orders. Two subjects were randomly assigned to each presentation

condition. Each subject was trained to mastery or maximum production time (two weeks) on the three signs in each training method before beginning training in the second method in their presentation condition.

Training was conducted in the following manner:

The examiner said the commands "Look at me," then "Do this _____." At this point, the picture referent of the sign to be trained was shown to the subject. This was followed by the examiner producing the sign in the manner necessary for that training method. The subjects were allowed 10 seconds for a response. If no response was made, the subjects were prompted in the following manner:

1. Imitation--experimenter repeats the correct response once with his own hands.
2. Molding--expeirmenter molds the child's hands into correct response one additional time.
3. Imitation/molding--experimenter touches or points to the part of the body where response is to be made, or examiner completes the response or makes part of the response on the child's body.

A process similar to the fading procedure used by Lovaas et al. (1966) was used in the molding and imitation/molding methods.

All correct responses with or without prompts were reinforced with food and verbal praise. Individual sessions totaled 30 minutes, consisting of approximately 10 minutes spent on the training of each sign, twice a day for 10 days. The time of each session was adjusted as mastery level was reached on a given sign. Correct production was determined with some flexibility on articulation, but general hand configuration and/or movement, along with

initial and final sign placement was correct. The entire training procedure was video taped allowing the external judges to validate subjects' responses after each session.

All subjects were trained to mastery (production of each sign without prompts three times in succession during a training session) or maximum time (20 sessions) for each sign. Ten seconds were allowed for a response after each stimulus presentation. For all subjects, each sign was trained in succession (sign 1; sign 2; sign 3; sequence repeated) with one trial per sign. At that time, the mastered sign was eliminated from the training procedure, and subsequent training sessions were shortened by approximately 10 minutes. This procedure was repeated for subsequent sign masteries.

Post-Test

One day after each subject reached mastery on a given sign, that subject was post-tested on production of that sign when presented with its picture referent. Correct responses were reinforced, and lack of response was prompted as per training. Each subject was also post-tested on the nine signs which were used in the imitation pre-test and the receptive sign pre-test to determine if incidental, expressive, or receptive learning occurred.

Results and Discussion

The use of non-parametric statistics was required due to the fact that much of the data did not meet the assumption of homogeneity of variance. When examining the results of the training measures, the number of times subjects reached criterion were compared between control and experimental groups. The experimental group (which received general imitation pre-training) appeared to produce more signs to criterion than the control group in raw scores. However, when the Fisher's Exact p was conducted, the results

were only marginally significant (Fisher's p = .06).

In order to employ a more sensitive dependent measure between groups, the number of correct responses per session were compared between groups. In order to correct for the number of opportunities subjects had to respond correctly, each subject's total number of correct responses was divided by the number of sessions he/she was presented for each target sign. The Mann-Whitney U test revealed that the experimental group had a significantly higher number of correct responses than did the control group (Mann-Whitney $U = 4$, $p < .05$).

Paired comparisons between each of the three presentation order times (method presented first compared to method presented second compared to method presented third) and each of the three sign training modes were conducted. No significant differences between times or modes were seen (alpha level _ .05).

Since no maintenance training was included in the study, it was not expected that correct responding would be maintained through the post-test probe. However, a point of interest was to determine if the direct effects of sign production and generally increased response to stimuli from the imitation pre-training group were maintained. Therefore, "incorrect" and "correct" responses on the post-test were collapsed into a general response category and contrasted with a "no-response" category. The Mann-Whitney U test revealed that the subjects who had received imitation pre-training responded significantly more often than the subjects in the control group (Mann-Whitney $U = 5$, $p < .05$).

In summary, the results indicated that the experimental group who received a pre-training, general imitation experience produced a greater number of signs to criterion than the control group who received only free play.

The experimental group also produced a significantly greater number of correct responses to the sign stimuli than control subjects. Examination of the post-test data revealed that experimental children responded significantly more often than control children to the post-test stimuli. Subjects also responded most frequently to sign stimuli presented in the imitation or imitation/molding modes. Therefore, it appears that pre-training in general imitation skills appears to have had a positive effect by increasing the subjects' chances of success during productive sign training, and their ability to form a response set. It may also tend to increase the level of response rate over a longer period of time.

The results of this study present numerous possibilities for researchers in the area of nonspeech communication with severely retarded, nonverbal individuals. Subjects who were trained to imitate gross-motor movements prior to being presented with manual signs learned to produce a greater number of these signs than subjects without imitative skills. This leads one to think that gross-motor imitation may be a facilitator for signing. In the process of training severely retarded children, teachers and clinicians are often so anxious to develop a form of functional communication for the children that they enter into this training without adequately considering prerequisite skills which may be essential to their goal. Perhaps training these individuals in gross-motor imitation is a link between cognitive stages, and will allow the children to progress more quickly toward functional communication. Experimental children in this study also produced a significantly greater number of correct responses than did control subjects. This further supports the notion that training in gross-motor imitation prior to the presentation of signs not only produces a greater total number of signs, but also produces significantly more correct signs per session than control

subjects could produce without this training.

Perhaps equally as important, children who were pre-trained in gross-motor imitation were able to respond more often to sign stimuli than control children in a post-test situation. This seems to indicate that retention or generalization of the response set is stronger in children who are pre-trained in general imitation. Even though extensive research needs to be conducted in these areas, teachers and clinicians may find this approach of immediate value, and may recognize similar positive results in their difficult clients.

In terms of sign training modes, pre-training in gross-motor imitation facilitated the production of signs in both the imitation and imitation/molding modes. Therefore, this pre-training was found to increase subjects' responses to the greatest degree in the two teaching methods most frequently employed by professionals. This implies that teachers and clinicians can continue to use the sign training mode of imitation/molding which is currently preferred. However, if clients have been trained in gross-motor imitation, the imitation/molding method may produce even greater results. Further, pre-trained children may also be able to benefit equally as well from imitation alone, which is the easiest method to employ. This may result in more efficient use of valuable teaching time for professionals.

Overall, for subjects in this study, pre-training in gross-motor imitation appeared to increase their success rate during expressive sign training and their ability to form a response set and maintain a higher level of response over time. However, this study simply scratched the surface of the problem. More research is needed to verify and extend these findings. Replication of the study with a larger sample and longer training times in each signing mode would strengthen the usefulness of these results. Also, the

inclusion of a third group of subjects who receive an equal pre-training time in sign production with the various methods is suggested to help identify the cause of the results.

Despite the limitations of this study, these results can be directly employed by teachers and clinicians with their clients. The main goal of these professionals is to promote functional communication in a noncommunicative population. While a single most preferred method to achieve this goal remains illusive, this research places us one step closer to a possible solution to this complex problem.

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